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EARLY-SEASON APPLICATION OF INSECTICIDES ON A COMMUNITY-WIDE BASIS FOR COTTON-INSECT CONTROL IN 1950

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This is the third report of community experiments in early-season control of cotton insects. Experiments in 1948 and 1949 were reported in Bureau circulars E-772 and E-792.

Farmers in the Satin and Bolton Bend communities near Waco, Tex., cooperated in 1949 and again in 1950. The numbers of farmers cooperating and the treated acreages were greatly increased in each community in 1950.

The cooperation in the Satin community, which is in the northern part of Falls County, was extended to include the adjacent Asa community, which is in the southern part of McLennan County. In this report this enlarged area will be called the Satin-Asa community.

All cotton on 21 contiguous farms, or a total of 3,084 acres of cotton in the Satin-Asa community received early-season insecticidal treatment. The treated area of this community was approximately 6 miles long and 2 to 4.5 miles wide. The large size of the treated area and the isolation afforded by the natural barriers--river, woods, brush, and pasture lands--surrounding most of the Satin-Asa community made possible the effective seasonal control of the boll weevil by the early-season application of insecticides.

Cotton was grown on 18 of the 19 farms in the Bolton Bend area in 1950. All cotton on 15 of the farms, or a total of 518 acres, received early-season applications of insecticides. On one farm the cotton received several early-season treatments with a bug-catching machine, and on two farms no treatment of any kind for insect control was made during the season. The two untreated farms were located on the northeast edge of the area.

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The entire Bolton Bend area is almost ideal for a community early-season insect-control project, because it is isolated by a 2-mile or more noncotton barrier on three sides with only small patches of cotton within 1/2 mile on the west side. It is bordered by the Bosque River and the City of Waco on the south, by the Bosque and Brazos rivers and marshy, wooded lands on the east, and by the Brazos and wooded areas on the north. Only the 15 farms that received early-season application of insecticides are included in this report of the Bolton Bend community. The treated area was approximately 3 miles in diameter.

There was a comparable untreated check area, also located in the Brazos River bottoms, for each of the two treated areas.

Treatments

A total of 3,602 acres of cotton on 36 farms received an average of 2.75 early-season applications of insecticides. Eighty-six (late-planted) acres received one application, 770 acres received two, 2,678 acres received three, and 68 acres received four. Ninety-three percent of the acreage was sprayed and 7 percent was dusted. A total of 345 acres received two late-season treatments for control of the boll weevil (*Anthonomus grandis* Boh.). A total of [illegible] once for control of the cotton leafworm (*Alabama argillacea* (Hbn.)). About half of the late-season treatments consisted of dusts and the other half were sprays.

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Two dusts were used, one containing 20 percent of toxaphene plus 40 percent of sulfur, and the other 5 percent of DDT plus 40 percent of sulfur plus sufficient benzene hexachloride to give 3 percent of the gamma isomer in the finished dust.

Five emulsion spray formulations were used. Toxaphene was used on 76 percent of the acreage. The emulsion concentrates contained the following toxicants (quantities per gallon): (1) toxaphene 6 pounds, (2) toxaphene 4 pounds and DDT 2 pounds, (3) benzene hexachloride 0.6 pound of gamma isomer and DDT 1 pound, (4) dieldrin 2 pounds, and (5) aldrin 2 pounds.

The sprays were applied by 4-, 6-, or 8-row tractor-attachment machines. In the early treatments 2 gallons of spray per acre was applied at 60 pounds pressure per square inch, with one nozzle per row. One pint of the emulsion concentrate per acre was used in the first of the three early applications and 1 quart of the emulsion concentrate was used in each of the two later applications. The first application was primarily for control of thrips and the second and third applications were primarily for control of the boll weevil. Late-season sprays were applied at a rate of 6 gallons per acre, with three nozzles per row, and either 3 or 4 pints of the emulsion concentrate was used per acre.

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The dust treatments were made with 6- or 8-row ground machines. The rate of early-season application was approximately 10 pounds per acre. Late-season dust applications were at the rate of about 15 pounds per acre. An airplane was used in a few of the late-season applications for boll weevil and leafworm control.

The dates for the early treatments ranged from May 21 to June 15, the averages being May 24 for the first application, May 31 for the second, and June 10 for the third. In 1950, records at Waco show that 86 percent of the boll weevils were out of hibernation by June 10 and 96 percent by June 15. No midseason applications were made. Late-season treatments were made in late July and during August.

Insect Infestations

In central Texas the winter of 1949 was mild, and a heavy emergence of overwintered weevils resulted during the spring and early summer of 1950. Extremely dry weather during March and the first 10 days of April delayed cotton planting on many farms. Most of the cotton in the Satin-Asa community was planted during the last 2 weeks of April, the average date of planting being April 23. Only three fields were planted in May. The plantings were later in the Bolton Bend community--during the last week of April on six farms and in May on nine farms, the average planting date being May 6.

The rainfall was about normal during May, June, and July, the principal cotton-growing months. It was 1.4 inches below normal in August, and the hot winds and droughty conditions in August caused deterioration and shedding of fruit on cotton that was not fully mature.

There was a medium to heavy infestation of thrips in practically every cotton field throughout central Texas during the latter half of May, and the damaging infestations continued in untreated fields until around the middle of June. The early-season insecticidal treatments in every field of both communities gave excellent control of the high infestations of thrips and started the cotton to growing and fruiting normally.

In the treated fields the early-season application of insecticides prevented damage by the cotton fleahopper (Psallus seriatus Reut.). This insect was present in damaging numbers in most untreated fields, although the infestations were never extremely high. During the peak of the infestation, around the middle of June, maximum infestations reached 40 to 60 fleahoppers per 100 terminals in the untreated fields, while 5 was the maximum for any field in the treated area.

The bollworm (Heliothis armigera (Hbn.)) caused practically no damage to either treated or untreated cotton. A threatening infestation of bollworms developed in one early-treated field of May-planted cotton in the Satin-Asa community. However, no poison was applied to this or to any other field in either community for bollworm control. Beneficial insects, particularly Orius insidiosus (Say), became very abundant in all early-treated fields shortly after the cotton began to bloom, and these predators evidently gave excellent control of bollworm eggs and young larvae.

Cotton in the Satin-Asa and Bolton Bend communities has for many years been severely damaged by the boll weevil. These communities are probably as well situated for heavy weevil carry-over and damage from year to year as any communities of similar size in central Texas. In 1950 the boll weevil was the insect of primary importance, and in the untreated cotton it caused tremendous damage.

The first of the three early-season treatments, which was primarily for thrips control, killed or thinned out the overwintering population of weevils to such an extent that comparable weevil population counts could not be made in all the treated and untreated cotton while it was in the presquare stage. However, sufficient presquare counts were made to establish the fact that relatively high populations of overwintered weevils-- 300 to 500 per acre-- migrated into both treated and untreated areas.

Immediately after the third application, or during the week ending June 16, 2 percent of the squares in the treated and 34 percent in the untreated cotton were weevil-punctured. For 6 weeks after the third treatment the weevil infestation remained extremely low, 10 percent or less, in both treated communities. By the seventh week, or during the week ending July 28, the treated cotton was mature, squares were scarce, and the infestation had increased to 29 percent, compared with 74 percent in the untreated cotton. The average weevil infestation for the season (June 11 to July 28) was 8 percent in the treated and 38 percent in the untreated cotton (table 1).

The three early-season applications of insecticides gave entirely satisfactory control of the boll weevil throughout the season on 90 percent of the acreage. Ten percent of the acreage received two late-season applications for weevil control, 75 acres in the Satin-Asa community and 270 acres in the Bolton Bend community. Most of the cotton matured before leafworms appeared. Control measures for this insect were necessary on only 240 acres, all late-planted.

Fruiting, Yields, and Profits

Although in most fields that were to be treated thrips became numerous and caused severe damage for about a week before the first application of insecticides, there was a quick recovery after treatment and the treated cotton began growing and fruited normally at least 3 weeks earlier than the untreated cotton. It was harvested 2 to 3 weeks earlier.

Bloom counts showed that by July 15 the treated cotton had produced 117,695 bolls per acre and the untreated 37,757. On the basis that 90 bolls were required to produce a pound of seed cotton and that the lint

Table 1. --Summary of field records made in community experiments in early-season application of insecticides for cotton insect control near Waco, Tex.

Community and status of fields	Number of farms	Acres	Percent of weevil-punctured squares, week ending --								Yield of lint, pounds per acre
			June 16	June 23	June 30	July 7	July 14	July 21	July 28	Average	
Satin-Asa:											
Early-treated	21	3,084	2	1	1	2	4	9	24	6	502
Untreated check	12	850	31	22	12	15	36	46	78	34	289
										Gain	213
Bolton Bend:											
Early-treated	15	518	3	5	3	4	10	9	34	10	304
Untreated check	5	204	35	51	34	23	27	46	69	41	192
										Gain	112
Both communities:											
Early-treated	36	3,602	2	3	2	3	7	9	29	8	474
Untreated check	17	1,054	34	36	23	19	31	46	74	38	270
										Gain	204

			Number of blooms per acre, week ending --					
			June 23	June 27	June 30	July 3	July 7	Average
Averages:								
Early-treated	36	3,602	1,838	2,199	4,438	6,578	9,160	4,843
Untreated check	17	1,054	137	201	900	1,908	3,752	1,380

turn-out was 37 1/2 percent, the cotton had produced sufficient bolls by July 15 to average 400 pounds of lint per acre in the treated area and 157 pounds per acre in the untreated. This was a full crop for the treated cotton and very close to the final yield, which was 474 pounds of lint per acre. Subsequent to July 15 fruiting increased in the untreated cotton but, as usual late-season insects and unfavorable weather reduced the percentage of fruits that remained on the plants and that matured into pickable cotton.

The average production of lint cotton per acre in the two communities was 474 pounds from the treated and 270 pounds from the untreated cotton a gain of 76 percent (table 1). The profit after deduction of all expenses of poisoning, picking, and ginning was $74.84 per acre.

Profits from cotton-insect control in the Satin-Asa and
Bolton Bend communities near Waco, Tex., 1950

	3,602 acres on 35 farms	
	Total	Per acre
Increased production		
Lint cotton, pounds	734,808	204
Cottonseed, pounds	1,084,202	301
Value of increased production:		
Lint at 40 cents per pound	$293,923	$81.60
Seed at 4 1/2 cents per pound	48,789	13.55
Total value	$342,712	$95.15
Cost of increased production:		
Insecticides		
2.75 early applications at 78 cents each	$ 7,726	$ 2.15
0.25 late applications at $2 each	1,801	.50
Labor and machinery cost of applying insecticides 3 applications at 50 cents each	5,403	1.50
Total cost of poisoning	$ 14,930	$ 4.15
Picking increased production at $2 per cwt.	$ 40,342	$11.20
Ginning increased production at 65 cents per cwt. plus $3.25 per bale for bagging and ties	17,865	4.96
Total cost of production and poisoning	$ 73,137	$20.31
GROSS returns	$342,712	$95.15
NET returns	$269,575	$74.84

Early Stalk Destruction

The advancement of maturity of the treated cotton by about 2 weeks made early harvest and early stalk destruction possible. Cotton picking was started in some fields by the second week in August and in most of the fields by August 20. Approximately 90 percent of the cotton was picked on 10 farms by August 31, on 18 additional farms by September 15, and on the remaining 8 farms by September 30. All picking was completed on 2 farms by September 15 and on 7 other farms by the end of September. Harvesting of most of the remaining cotton was finished by the middle of October, although a small amount remained to be harvested as late as November 1.

Stalk destruction had never been practiced to any extent in either community before 1950. Stalk-shredding machines were used in destroying most of the stalks. They were usually followed by tandem discs or plows. This combined treatment disposed of the stalks and at the same time turned under the green vegetation to enrich the soil. Stalk destruction was completed on 1 farm by September 10, and on 6 additional farms by September 30. Ninty percent or more of the stalks were destroyed on 29 of the 36 farms by October 15 and on all except 1 farm by November 1.

Discussion

Accurate yield records for the past 4 years (1947-50) are available for each of the 15 farms in the Bolton Bend community that received early-season treatment in 1950. In spite of the fact that 1947 is considered the best year in the last ten for cotton production in McLennan and Falls counties, and in spite of the fact that in 1949 one-third of the farmers in the Bolton Bend area greatly increased their production by practicing early-season insect control, the average yield per acre in 1950 was 22 percent higher than in 1947, 63 percent higher than in 1948, and 34 percent higher than in 1949.

As already stated, two farmers in the Bolton Bend area used no insect-control measures in 1950. On strictly comparable land and cotton, on June 23 the untreated cotton averaged 63 percent punctured squares as compared with 5 percent on the 15 nearby farms that had received early-season insecticidal treatments. The average yield on these two untreated farms was 200 pounds of lint per acre as compared with 306 pounds on the 15 treated farms, a gain for the treated cotton of 53 percent.

Every field that was included in the untreated check area of the Satin community in 1949 was in the treated area of the Satin-Asa community of 1950. The average production of the untreated cotton in 1949 was 185 pounds of lint per acre, whereas on these same farms in 1950, cotton that received 3 early-season treatments produced an average of 434 pounds per acre, an increase of 135 percent.

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The 7 untreated fields of the Bolton Bend community of 1949 produced 172 pounds of lint cotton per acre. In 1950 these fields received 3 early-season treatments and no late-season treatments, and the production was 406 pounds of lint per acre, an increase of 136 percent.

Several cotton growers in the Satin-Asa community have been farming the same land for 20 years or more. These growers produced more cotton per acre in 1950 than during any of the past 20 years, and many of them spent far less money for poison. The community average on the 21 farms was much higher in 1950 than in any of the last 20 years. This could not be due to increased fertility of soil, because legumes and commercial fertilizers have not been used to any extent in this area. The farmers in the Satin-Asa community all give a large part of the credit for this exceptionally high production to early-season control of insects.

The grade of cotton was also much higher than usual. Over 80 percent of the cotton graded strict middling and 90 percent graded middling or better. The Lankart gin, which gins most of the cotton from the Asa-Satin community, was complimented in early September by the Bureau of Census and the Cotton Branch of the Production and Marketing Administration because during August it had ginned most of the bales of cotton and the cotton ginned had the highest grade of any of the 450 gins in 29 central Texas counties.

Summary

All cotton on adjoining farms in two communities near Waco, Tex., received three early-season applications of insecticides for control of cotton insects. A total of 3,602 acres was treated on 36 farms. Most of the sprays consisted of toxaphene emulsions, and were applied by low-gallonage, low-pressure ground machines. Sprays were used on 93 percent of the acreage and dusts on 7 percent.

The dates of the applications ranged from May 21 to June 15. The communities were sufficiently large and isolated that the early-season applications gave entirely satisfactory control of the boll weevil (Anthonomus grandis Boh.) on 90 percent of the acreage.

No midseason poisoning was done. No late-season treatments were made for control of the bollworm (Heliothis armigera (Hbn.)) and no damage was done by this insect. Beneficial insects were plentiful in all fields, and are known to have prevented serious damage in at least one field where bollworm infestations were threatening.

Early-season treatment accelerated early fruiting to the extent that the treated cotton matured and was harvested 2 to 3 weeks earlier than the untreated cotton. It was therefore possible to destroy the cotton stalks early. Most of the stalks were destroyed by September 30, and nearly all of them by October 15. The elimination of insect damage also resulted in a higher grade of cotton.

In the two communities the average production of lint cotton per acre was 474 pounds from the treated and 270 pounds from the untreated cotton, a gain of 76 percent. The net profit was $74.84 per acre, or $269,575 on the 3,602 acres.